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Original Research

Injuries before and after deployments to Afghanistan and Iraq

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SUMMARY

Objective: To examine outpatient injuries before and after deployments of elements of the 10th Mountain Division to Afghanistan ($n = 505$ men) and the 1st Cavalry Division to Iraq ($n = 3242$ men).
Study design: Observational.
Methods: The military units provided a list of deployed soldiers, and soldiers' outpatient medical encounters were obtained from the Defense Medical Surveillance System. Cumulative injury incidence was examined for two consecutive 90-day periods before the deployments (Periods 1–2) and two consecutive 90-day periods after the deployments (Periods 3–4).
Results: Both groups showed post-deployment increases in the overall incidence of injury (Afghanistan group = 14.1%, 14.1%, 16.4, 23.4%; Iraq Group = 15.1%, 12.4%, 35.4%, 43.4%; Periods 1–4, respectively). Soldiers with pre-deployment injuries were 1.4–3.0 times more likely to experience post-deployment injuries.
Conclusions: This study found a post-deployment increase in the incidence of outpatient injury. Also, soldiers with pre-deployment injuries were more likely to experience post-deployment injuries.

Introduction

Previous studies have shown that injuries are a major cause of morbidity and mortality among soldiers returning from military deployments. Among service members who were deployed during the First Gulf War, the most common reasons for post-deployment hospitalization over a 10-year follow-up period (1995–2004) were musculoskeletal problems [International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes 710–739], digestive system problems (ICD-9-CM codes 520–579), and injuries and poisoning (ICD-9-CM codes 800–999), accounting for 33%, 24% and 21% of all hospitalizations, respectively (exclusive of pregnancy-related conditions).[1] Another study[2] examined hospitalizations in serial cohorts of service members who completed deployments to Afghanistan or Iraq between 1 January 2002 and 30 September 2006. The highest rates of hospitalizations were for injuries and poisonings; musculoskeletal and connective tissue disorders ranked fourth after injury and poisoning, pregnancy-related conditions and mental health. A recent systematic review demonstrated that injury-related mortality was 1.26 times higher among veterans who served in Vietnam

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and the First Gulf War compared with those who had not been deployed to the conflict zones.[3]

While these studies explored post-deployment hospitalizations and injury-related mortality, to the authors' knowledge, no previous studies have examined outpatient medical encounters for injuries before and after deployment. In response to reports of elevated post-deployment injuries, the Chair of the Military Training Task Force of the Defense Safety Oversight Council asked the Army Medical Department to investigate injury rates among deployed soldiers. The present study compared the pre- and post-deployment injuries of soldiers deployed to Afghanistan and Iraq.

Methods

The unit that deployed to Afghanistan was a battalion of the 10th Mountain Division garrisoned at Fort Polk, Louisiana. Soldiers from this unit are hereafter referred to as the 'Afghanistan cohort'. The unit that deployed to Iraq was a brigade of the 1st Cavalry Division garrisoned at Fort Bliss, Texas. Soldiers from this unit are hereafter referred to as the 'Iraq cohort'. This project was approved as a public health practice project[4] by the US Army Public Health Command.

A list of deployed personnel was provided by the Personnel Offices of the two units shortly after they returned from deployment. For the Afghanistan cohort, only the soldiers in the four deployed rifle companies making up the battalion were provided (no headquarters personnel). This consisted of 505 male soldiers. For the Iraq cohort, all personnel (combat, combat support and combat service support) who deployed with the unit were provided. This consisted of 3496 soldiers (men = 3242, women = 254). Soldiers who were killed in action were not considered in the analyses.

Medical data (injuries) were obtained retrospectively for two consecutive 90-day periods just before deployment and two consecutive 90-day periods just after deployment. Periods 1 and 2 were 185–95 days and 94–4 days before deployment, respectively. Periods 3 and 4 were 4–94 days and 95–185 days after the troops returned from deployment, respectively.

The Defense Medical Surveillance System of the Armed-Forces Health Surveillance Center (AFHSC) regularly compiles data on ambulatory (outpatient) encounters that occur within military treatment facilities, as well as those that occur outside military treatment facilities but are paid for by the Department of Defense. The list of deployed personnel was provided to the AFHSC. The AFHSC returned de-identified visit dates and ICD-9-CM codes for all outpatient medical visits within the four time periods listed in Table 1. The first four diagnoses for each visit were considered, although a single visit usually only included one diagnosis. An injury case was identified if a soldier had a specific ICD-9-CM code that was included in one of five injury indices. These injury indices were the Installation Injury Index (III), the Modified Installation Injury Index (MIII), the Training Related Injury Index (TRII), the Overuse Injury Index (OII) and the Comprehensive Injury Index (CII). All indices included specific ICD-9-CM codes, as described previously.[5]

The III has been used to compare injury rates among different military posts and is reported on a monthly basis at the AFHSC website (http://afhsc.army.mil/), where the specific ICD-9-CM codes are also provided. The MIII is similar to the III but captures a greater number of overuse-type injuries (i.e. those resulting from cumulative microtrauma). The OII specifically captures the subset of both upper and lower body overuse-type musculoskeletal injuries, and includes diagnoses such as stress fractures, stress reactions, tendonitis, bursitis, fasciitis, arthralgias, neuropathies, radiculopathies, shin splints, synovitis and strains. The TRII is limited to lower extremity overuse injuries, and has been used to compare injury rates among basic training posts. The CII captures all ICD-9-CM codes related to injuries, both traumatic and overuse.

Demographic information was provided by the AFHSC from data they obtained from the Defense Manpower Data Center. Demographic data included rank, educational level, marital status, race and gender. A comparison of demographics among the men in the two cohorts was accomplished using Chi-squared statistics.

Cumulative injury incidence for each of the five injury indices was calculated for each of the four 90-day periods as:

$$[(\sum \text{Soldiers with} \geq 1 \text{ injury visits}/(\sum \text{of all soldiers})] \times 100\%.$$

For each injury index, comparisons of cumulative injury incidence between each of the four periods were determined by the McNemar test. The McNemar test allows for comparison of frequency data involving repeated measures on the same individuals.[6] For the CII, risk ratios and 95% confidence intervals were calculated to compare risk of a post-deployment injury among soldiers who did and did not have a pre-deployment injury.

Results

Demographic data

Table 2 shows the demographic data of the Afghanistan and Iraq cohorts. For the Afghanistan cohort, junior-enlisted

Table 1 – Dates of the four 90-day pre- and post-deployment observation periods of the Afghanistan and Iraq cohorts.

Cohort	Pre-deployment		Post-deployment	
	Period 1	Period 2	Period 3	Period 4
Afghanistan	2 Sep 05–30 Nov 05	1 Dec 05–28 Feb 06	1 Dec 06–1 Mar 07	2 Mar 07–30 May 07
Iraq	24 Apr 06–22 Jul 06	23 Jul 06–20 Oct 06	3 Jan 08–2 Apr 08	3 Apr 08–30 Jun 08